

# GENERAL ASSESSMENT FRAMEWORK FOR MULTI-USE FLOOD MITIGATION INFRASTRUCTURES

This first part of the work will consist in the elaboration of the analytical framework of multi-use flood management infrastructures. As it was said in the introduction, the method will be based on the TRANS-ADAPT criteria. The idea is, in the first place, to understand the criteria to adapt them to our work and our research issue and make them more understandable. Some of them can be kept or others can be modified, according to our subject. We will try to define them precisely and bring out indicators for each of them to make them assessable more easily thereafter. Thus, this first step will bring to a general analysis grid. The second part will then consist in the elaboration of an adaptation method of the assessment grid just realised in order to make it adaptable to any case study of multi-use infrastructure.

## I. Five criteria for a complete evaluation

This first sub part will present precisely every criteria forming the analysis framework, namely economic efficiency, technical feasibility, accountability, social justice, and vulnerability. The third criterion, accountability, will be divided into three sub criteria because of the extent of aspects it covers. For each one, a precise definition, including the scoring that can be obtained by an infrastructure, will be presented, followed by the explanation of the indicators elaborated for their analysis.

### 1. Economic efficiency: a global criterion close to cost-benefits analysis

Concerning flood risk management, the economic aspect is important. Indeed, flood hazards cause important material (and human) damages, being the source of the economic paralysis of the concerned area. The private or public buildings repairs and renovations but also damages on the different networks (transports, telecommunication, water and energy) create important cost for the society. For example, the torrential flood in the Var, in 2010, touched 1000 companies, caused the death of 25 people and the financial damages were estimated to 1 billion euros (Ministère de l'Ecologie, du Développement Durable et de l'Energie, 2011). The prevention principle, applied in French flood risk policies, aims at minimising or avoiding these consequences by reducing the human and economical stakes exposed to the flood risk. Besides, an analysis method called cost-benefit analysis (CBA) has been set up for the development of flood alleviation schemes. This method, intended to the local authorities and engineering consulting firms, aims at calculating the economic profitability of a prevention measure, by comparing the implementation costs and the profits made, that is to say, the avoided damages. This method is largely approved and used by the scientific community, furthermore it has become inescapable to aspire to grants

from the State or the European Union (FEADER) for the implementation of PAPI programs (EPRI, 2011). So, the economic aspect and the evaluation of the avoided damages are an important question in France, and more largely in Europe.

### ***Definition***

Economic efficiency is a term that comes from the analysis of economic activities. It is an optimum; the best situation for a business regarding the “*rational consumption of resources, materials, labor and financial resources using for this purpose [but also] scientific methods of management and organization of productive activities*” (Birle Vasile, 2014). In our context, economic efficiency reflects if the multiple use of the infrastructure creates positive outputs and which inputs where necessary for that.

Concerning our study, the indicators to consider relate the difference between outputs and inputs in the following domains. Here we have adapted the economic efficiency to our subject; the multiple use of flood protection infrastructure.

To evaluate the economic efficiency of multiple uses in flood protection infrastructures, we have to see if there is creation of more units of the sub-criterion which are: employment, property value, we also have to look at the monetary indicators and how the environment was impacted or benefitted from those creations.

The scoring here is a blend of three levels, the less there are inputs compared to outputs, the best the economic efficiency is for the project :

- The first level consists on a project which used much more inputs than outputs for its creation.
- The second one is quite ideal because it is the case when the inputs exactly correspond to the outputs. That means that in detail, in each sub-criterion of economic efficiency, there is a balance.
- The third and last level represents the best project concerning the efficiency. It is reached when there are fewer inputs than outputs.

Even if all the sub-criteria cannot be compared directly because they are not of the same kind, the aim of this analysis is also to understand who they are linked to. For example, did the creation of jobs help to increase the property value or impacted the quality of the environment?

### ***Indicators***

To evaluate the economic efficiency and discover on which level the project stands concerning this criterion, we need some indicators. As the economic efficiency is a large criterion which embraces many various notions, the sub-criteria imply different indicators. To analyse the impact of the project on employment, we should look if new jobs are created, if some disappeared and what kind of jobs are there. So we can determine the outputs for this sub-criterion and their value. Concerning the property value which represents the cost of houses or flats, we have to find the evolution of it between

the price it cost before the project and after. If the value of the land increases, then the outputs are considered as higher than the inputs. About the monetary indicators, they are studied to understand what the valuable amounts are to create or created by the multiple uses. Monetary indicators represent the amounts of money which are invested for the project and the amount of money gained thanks to it. Here again, the more gains compared to investments, the better the efficiency. Finally, we also consider the environment because it is often impacted by the project. That means that environment (biodiversity, species, quality of it) is like inputs used for the project. Sometimes, there is also creation of new wildlife spaces and in this case the assessment would be positive for this sub-criterion.

## 2. Technical feasibility: a criterion closely linked to the kind of infrastructure studied

### *Definition*

The technical feasibility concerning any infrastructure depends on the technological knowledge developed around this subject. Feasibility is defined by the Cambridge Advanced Learners Dictionary & Thesaurus as *“the possibility that can be made, done, or achieved, or is reasonable”*. As for Technical, it is defined *“relating to practical skills and methods that are used in a particular activity”*.

In this way, to determine if a flood protection infrastructure is technically feasible, the technicians have to confirm that it is possible to obtain the appropriate technical knowledge to build the infrastructure.

The technical feasibility of flood infrastructure protection depends on the kind of flood it has to deal with, its frequency and speed, the height of the river and its width. All the criteria that define the characteristics of the river and the type of flood have to be considered. Determine if an infrastructure is technically feasible means that the risk is known and the characteristics of the flood as well. An infrastructure is not feasible until the technology does not exist to do it. We also consider that an infrastructure which would not last in time can be considered as technically “non-feasible”.

Therefore we analyse this criterion with three ranks of scoring;

- The infrastructure is feasible regarding the current knowledge and is planned to last in time.
- The infrastructure is feasible but is using a new technology which has not made its proof; it is hard to predict its last in time.
- The infrastructure is not feasible; there is no technology to do it.

The best moment to use this criterion in a global analysis is before the creation of the infrastructure. That can help to define how well-prepared the building plan are and maybe permit to say that the infrastructure is not as feasible as it seemed firstly.

### **Indicators**

To determine how feasible an infrastructure is, we have to look at some indicators which could be innovation, functioning investment and interaction with others techniques. To determine how innovative an infrastructure is, we should find which skills are mobilised, how old they are and if they already have been tried before. The ability to do something also depends on the actors who realise the project. Then to say if the infrastructure was planned to last in time, we can observe the functioning investment that traduces the necessities to maintain the infrastructure. The higher this investment will be, the worst the infrastructure would have been planned to last in time. Finally, concerning the presence of other uses, the criterion of technical feasibility has to consider the interaction between the infrastructure built to protect from flood and the other uses. For example, during our research of latest developments, we found the example of Vitrolles, where a velodrome was built into a retention basin. In this way, we can ask the question; does this use of the infrastructure impact the flood management or not? Then two options appear, on one hand, that can helps maintaining the flow during a flood period, because the maintenance is well-done, in link with this use. On the other hand this use can plug the water evacuation because technically, the compatibility of the velodrome and the flood protection infrastructure did not exist.

Those indicators will allow us to say that the multiple uses are feasible regarding the flood protection infrastructure and if its function to protect from flood is still well working.

### **3. Accountability: a complex criterion**

Now, we will focus on the criterion of accountability. According to the business dictionary, accountability refers to the obligation of a person or an organisation to account for its activities. This means that each responsible of an action must be able to answer at several questions like why he made this project, how, by what means, etc. In other words they must be able to justify their choices and the means they used. In fact, this term can refer to the notion of responsibility of the different actors on a project. Like L. David Brown and Jagadananda wrote on their book “Civil Society, Legitimacy and Accountability: Issues and Challenges”, accountability refers to the “*responsibility to answer for particular performance expectation to specific stakeholders*”. For example, private sectors have to account to owners, and stockholder and public organisms are accountable for voters. Nevertheless, in literature, we can find plenty of definitions of accountability. In our research program, we want to evaluate the multi-use of flood infrastructures. It can concern the responsibility of politics; is the project justified in terms of global policies?

But it can also concern the way that the project is made; was it made with the consultation of the population? Were the needs of population taken into account? To better understand the criterion of accountability, we decided to divide it into three sub-criteria: relevance, legislative legitimacy and citizen legitimacy. Because accountability could have a lot of definitions, it is easier to develop this criterion in three, which is part of the definition of accountability given before. In TRANS-ADAPT, the notion of accountability is linked to the legitimacy, but for us, it is just a part of accountability. J Thomassen defines two ways for assessing the legitimacy in his web publication “Citizens and the legitimacy of the European Union”, in June 2007. The first one consists in “*evaluate the political system against normative theory, inquiring to what extent political system conforms to certain normative*

*criteria*". That is what we will call in the following paragraphs the legislative legitimacy. The second way to evaluate this legitimacy is "*to empirically determine to what extent the political system is right in the eyes of relevance beholders*". This notion is what we will call the citizen legitimacy afterwards. Finally, accountability is linked to the justification of a project, therefore, to our mind, it seems interesting to evaluate the notion of relevance.

## Relevance: the consideration of needs and uses

### *Definition*

With the criterion of relevance, we want to evaluate if the aims of the project are consistent with the users' expectations or the needs of the country, city or neighbourhood, depending on the scale. According to Jorge L. Mendoza, relevance can be evaluated with conceptual criterion and actual criterion. The first one concerns "the theoretical construct we would like to measure", in our case for which activities the multi-use is made. The second actual criterion, is close to "the operational definition that we end up", in other terms appropriate to the multi-use, how the structure is used today and by whom.

The closer the two criteria are, the more the project is relevant. As indicators we can find three levels of results:

- The first one, the most relevant level, is when a new multi-use scheme meets the needs of the population and infrastructures are used as it was planned to be used.
- The second level is when the reasons to make a new use do not correspond to the needs of the population but the creation of this infrastructure creates new needs, and the infrastructure becomes useful.
- The third level is when the reasons to make a new use do not correspond to the needs of the population and the infrastructure is not really used.

### *Indicators*

To evaluate the relevance of the multi-use, we have to focus on the part before the development of the multi-use in the infrastructure and study the needs of population back then. Then we have to see if they correspond to the use today. It seems also important to focus, for this part, on how people use the infrastructures and if actors based on needs to create new activities on the infrastructure. In fact, attendance of the second, or more, use of the infrastructure could be a good point to know if this second use is relevant according to users. To resume, the criterion of relevance can have two indicators: needs of population and the utilisation of the second, or more, use.

## Institutional legitimacy: a sub-criterion directly linked to the law

### *Definition*

The second point to evaluate the accountability is to question the legislative legitimacy of the project. In L. David Brown's work « *Civil Society Legitimacy and Accountability: issues and challenges* », legitimacy is defined as “*the perceptions by key stakeholders that the existence, the activities and the impacts*” of a project “*are justifiable and appropriate in terms of central social values and institutions*”. This definition of legitimacy leans on Edward's one, describing the legitimacy as the right to be and to do something in the society. So, in order to study the accountability of multi-use projects, we will focus on the legal legitimacy.

In France, the government has set up a flood risk policy based on a prevention principle. This principle prescribes a quite strict policy of non-urbanisation in flood risk areas which goes against the urban development. Most of the time, there is no urbanisation in the case of multi-use, at least not housings or economical activities which could be devastated by a flood. The multi-use in flood alleviation schemes leads more to recreational or sports infrastructures, like family gardens, playgrounds or sports ground.

After analysing the institutional legitimacy, we can see where the case study is located between the different levels of this legitimacy.

- The first one is the one where the project is in accordance with the law, each stage of the implementation of the project is right and there were no mobilisation against this project because of its illegality. It is the right institutional legitimacy.
- The second one is when this legitimacy is moderately right. For example if the regulations have been changed in order to make a project legitimate or because there were mobilisations against.
- The last level is for a wrong legitimacy. This one occurred when actors break the law in order to realise a project. This is the case for example if they do not respect the regulation given by risk prevention plans or other documents of this type.

### *Indicators*

Considering the definition above, the issue is to know if the implementation of multi-use in flood alleviation schemes is legally authorised by laws and regulations. In fact the main indicator for this criterion is the legal situation of the implementation of multi-use. There may be some incoherence between what is legislated and what local authorities want to do on the infrastructure for flood risk. To evaluate this, we need to focus on the main documents which set up the regulation of flood hazard areas. To see that, it could be interesting to know where the case studies is located comparing to the flood risk prevention plan and what is the regulation of this. Then we can search if there is any decree taken by the prefect to cancel the project or to oblige the city to do something on this area. Then, it could be interesting to see if there was a kind of mobilisation to reconsider the project because of its illegal aspect. This information could be found in press articles or thanks to interviews with different actors of projects.

But this legitimacy also needs to be evaluated through citizen participation, because legitimacy also involves the consideration of population's needs and wishes.

## Citizen legitimacy: the influence of the population

### *Definition*

Finally, the last criterion linked to the concept of accountability concerns another aspect of legitimacy, the citizen one. In order to know if the project could be justified, it seems important for us to see if the population accepts the project. In fact, the citizen legitimacy refers to the correctness of the project for the population and users. Three scales can be defined for this criterion, like for the previous one.

- The first one can be defined as the one of the right citizen legitimacy. It implies that the citizen participation is well done and regarding the situation, this participation is on one of the highest levels in the Arnstein ladder. Moreover, at this level, there is no mobilisation against the project led by anyone.
- The second level is when the citizen legitimacy is moderate. In fact, it could correspond to a situation where there is no mobilisation against the project but the participation is not as good as the previous level. In the Arnstein ladder, it corresponds more to the second level.
- The third one corresponds to wrong citizen legitimacy, when there is no participation of the population but a lot of mobilisations.

### *Indicators*

One of the indicators referring to the citizen legitimacy is the participation. According to Myung Jin<sup>3</sup>, "*citizen participation contributes to legitimating governmental affairs*" and increases the legitimacy in terms of decision-making process. Citizen participation means that citizens can give their opinion on a project or even propose their own ideas. But several methods can be used to involve citizens. Sherry R. Arnstein, has worked on the citizen participation and its evaluation, and has reported her findings in an article: "*A Ladder of Citizen Participation*" in 1969. This ladder is still used today by sociologists to assess how local authorities inform citizens and allow them to participate in decision-making. This ladder has eight types of participation, classified into three levels of engagement, as we can see in the following table.

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<sup>3</sup> Myung Jin. "Citizen Participation Trust, and Literacy on Government Legitimacy: The Case of Environmental Government." Accessed October 12, 2014. <http://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=1021&context=jsc>.

LEVEL OF ENGAGEMENT	TYPE OF PARTICIPATION	TYPE OF INVOLVEMENT
<b>Citizen power</b>	Leaner Control	In this last and highest type of participation, citizens are entirely in charge of design, planning and management tasks.
	Delegated power	This type of participation looks like the previous one (partnership) but in this case, citizens have a majority government which confers them a real authority on decision making.
	Partnership	Strictly speaking, participation begins at this type of participation. The decision power is redistributed between citizens and stakeholders via a negotiation. Citizens accept to be in charge of the elaboration of the project and the decision making through institutions like planning committees.
<b>Tokenism</b>	Placation	Placation consists in authorizing or inviting citizens to give advices and to make propositions but stakeholders remain the only judges of these previous advices and propositions.
	Consultation	As the information to the public, the consultation signifies also a type towards effective participation. Stakeholders can consult citizens via public polls, community meetings or public hearing but consulting does not insure the consideration of citizens' expectations and suggestions.
	Informing	This type of participation is the first step to an effective participation, in a sense that citizens are informed about the ins and the outs of the plan, but this type of participation is insufficient. Indeed, it creates a one-way type of communication in which citizens' view are not actively sought in decision making processes.
<b>Non participation</b>	Therapy	This type of participation is used when citizens would/could protest against stakeholders' decisions. So, stakeholders used citizens, making them involved in promoting information campaigns and distracting their protestations.
	Manipulation	In the name of civic participation, citizens are asked to rubberstamp decisions already taken by stakeholder. In reality, this type of participation is used as a communication tool for the benefit of stakeholders; in this way, stakeholders get the support of citizens.

**Table 1: Arnstein ladder of participation**

To find the level of the participation in case study, it is important to see which power is given to the population, how they can participate. The influence they had on the project could be interesting to study, as well as the way their opinion was taken into account to realise the project.



Moreover, citizen legitimacy can also concern all part relative to acceptance of a project by the population, especially the one directly concerned by the project, but also associations, this is a second indicator. Set up a multi-use in an infrastructure for flood management can have consequences on several points, like nature and biodiversity, flood risk protection, landscape, etc. Population, particularly through associations, can give their opinion, for a better consideration of all aspects of the potential consequences of the project. In fact, to evaluate this, we have to find if there were events or mobilisations realised by citizens or associations to oppose themselves to the project.

#### 4. Social justice: evaluation of the fairness

##### *Definition*

The criterion social justice, in the context of multi-use infrastructures raises the question of equity and non discrimination both in terms of protection against flood and in terms of access to the activities. Those two aspects of the infrastructures must be fair for everyone. Thus, the main aim of this criterion is to assess whether the multipurpose serves everyone equally, or on the contrary, if it disadvantages a certain population or an area, concerning both the risk protection and the activities. Then the analysis of this criterion will be divided into two sub analysis, the first one concerning the equity concerning flood protection, and the second one concerning the equity in terms of access to the activities.

So in short, for the risk aspect, the premise is that a measure done in one place to reduce flood risk should not affect negatively other populations or areas in terms of vulnerability to flood. So to judge this equity it is important to see how the most vulnerable and poor populations, are served by the measures and the work. Thereby, the fairness of flood protection in a multipurpose work can be judged by the five following levels of flood management, proposed by Peter Newborne<sup>4</sup>.

- First, there is the negative discrimination, in which there is a most important support to population who are already relatively well protected. This level can also include cases where those actions have negative effects on other areas or populations.
- The second level is the unconsciousness, reflecting a lack of awareness to different levels of vulnerability to flood and/or a lack of concern to help populations who are the most vulnerable.
- There is a third level, corresponding to an impartial treatment. In that case no particular population or area is preferred. This is the privileged one.
- Then comes a fourth level, called consciousness where there is an awareness of the different levels of vulnerability to flood and a concern to help population who are most vulnerable.
- Finally, there is the positive discrimination, where mostly populations relatively poorly protected against flood risk are targeted.

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<sup>4</sup> Peter Newborne. Accountability and Non-discrimination in Flood Risk Management: Investigating the potential of a rights-based approach, Honduras case study, 2008.

Concerning fairness and equity in terms of access to the activities other than the flood protection, the idea is similar. None of the activities practiced on the site should have negative impacts on the other ones, and in any case, activities should privilege or disregard one type of population. So, to evaluate that part of the criterion, a simpler scale can be applied. Three levels, highly discriminatory, moderately discriminatory and not discriminatory at all, are sufficient to assess the fairness of the activities.

### ***Indicators***

To determine the level of social justice of a multipurpose infrastructure, two main indicators must be analysed. The first one will focus on fairness and equity in terms of flood protection, and the second one will focus on fairness and equity in terms of access to the activities.

For the first one, it is relevant to wonder if a kind of population or a specific area is prioritised, or on the contrary disregarded, in terms of flood protection and potential or actual impacts in case of floods. This first indicator can be analysed through different aspects. It is for example interesting to see if there are people living on the site, if or how do they chose to come here, if they were present prior to the implementation of the infrastructure and how their presence is taken into account. Besides, if there are or could be some impacts, they need to be analysed, to determine the kind of area or population affected, in or outside the infrastructure area. It is also necessary to find out if before and during the implementation of the infrastructure the fact that it would happen was known.

Secondly, it is necessary to know if the activities practiced on the site serve a specific or a global population. This indicator can be characterised by exploring deeper some interrogations. For example analysing the kind of activities developed on the site and their degree of vulnerability will permit to see if they correspond to activities practiced and aimed to all sorts of populations or not. It is necessary to determine if a type of population is specifically served by the activity or was specifically targeted during its elaboration or not, or on the contrary disregarded. It is also interesting to analyse the location of the infrastructure, because it can be a source of discrimination if it is located in a difficult place to access for everyone.

## **5. Vulnerability: a compromise between the risk and the benefit**

### ***Definition***

The vulnerability of a multipurpose work can be defined as the trade-offs made between perceived risk and perceived benefit.<sup>5</sup> So in short, “*the greater the perceived benefit of a particular activity or area, the greater the risks that a society is willing to accept*”. So this criterion does not consider vulnerability properly speaking as a degree of fragility of the space, but more as a degree of subjective representation of the site given. It depends on the compromise made between the importance attached to the protection and the secondary activity(ies).

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<sup>5</sup> Raaijmakers, Ruud, Jörg Krywkow, et Anne van der Veen. « Flood Risk Perceptions and Spatial Multi-Criteria Analysis: An Exploratory Research for Hazard Mitigation ». *Natural Hazards* 46, n° 3 (septembre 2008): 307-22.

More precisely, there are three major levels of trade-offs, leading to the three following levels of vulnerability, from the most to the least significant.

- If a particular activity is chosen over an effective work against flood risk, the vulnerability is higher whereas the risk could be reduced more significantly. The given activity even accentuates it. This is the first level of vulnerability, where the trade-off is in favour of the activity and not flood mitigation.
- In the second level the trade-off is fair. Measures are taken thinking equally for both the desired activity and flood mitigation. It is the best case.
- The third level of trade-off considers flood mitigation first, over the activity. In that case it is a shame if the land remains poorly or totally unused whereas there is a possible use or need for the area.

### *Indicators*

Here again, in order to associate a level to the case study, a series of interrogations need to be dug deeper. In the evaluation of this criterion there are two main ideas, corresponding to two indicators.

The first aims to evaluate the evolution of the activities installed on the site in order to determine if the possible modification of the activity has impacts on the consideration of flood hazard, which is initially the main importance of the infrastructure. To evaluate this indicator, it is important to focus, inter alia, on the history and the evolution of the activity and to draw a parallel with the eventual events that occurred.

The second indicator aims to analyse the level of consideration of the flood risk in the activities. So here, it is also important to focus on the evolution of the activity and more specifically on the conscience and the knowledge of the risk from the actors. It is important to see how each activity takes the risk into account, to see if it is enough and equal or if the risk has been forgotten with the increase of the activities. In order to evaluate this, it is necessary to look at the flood levels considered for each infrastructure for example, if it is an optimistic or pessimistic prevision.

In conclusion of this part, we can see that the criteria are varied and cover various aspects, from both economical and social issues, as well as political ones. Indeed, the economical aspect is assessable by the criterion economic efficiency, which takes different issues into account, including the employment, the resources or the investments ones. The social aspect is well treated by the criteria social justice, which focus on equity and fairness of the infrastructure. And the political aspect, in a large sense, is treated at the same time by accountability and its sub criteria, which focus at the same time on legitimacy and relevance issues, and by the vulnerability criterion, which is considered here as the result of the management compromise made between flood protection and the activities. So the assessment grid elaborated is rather complete and does not privilege one particular aspect. Now that the general assessment framework has been elaborated, the next part will focus on the adaptation method to make it adaptable to any multi-use flood management infrastructure case study.

## II. An evaluation framework adaptable for any case study

Before starting the assessment of the Gloriette floodplain, adjustments must be done on the assessment framework elaborated previously. Indeed, this is a general framework to evaluate all kinds of multi-use infrastructures. Therefore all the criteria will not be appropriate or assessable in every case study.

In order to adapt the evaluation grid and determine which criteria will or will not be analysed, a classification can be done according to different factors. This step also permits to question the relevance of the assessment framework in a more global context, because initially the criteria are supposed to be used for any flood mitigation multi-use operation.

The following method to elaborate an appropriate evaluation grid needs to be adapted to every case study. This sub-part proposes a general guide, and the next part will consist in its application to the Gloriette case study. The first step is the evaluation of every criterion according to the following different factors.

### 1. The importance

The degree of importance given to the criteria and the sub-criteria is the first factor, because all of them actually do not have the same importance to assess the profitability of an operation. In fact it depends on the different aspects of the given case study. As an example, the kind of activities done on the site is really important to determine the relevance of the criteria. If we consider the Afsluitdijk again, the freeway-dike in The Netherlands, which was presented in the introduction, we can see that the criterion social justice is not a really relevant one, because a freeway is actually a public infrastructure aimed for everyone, so there is not much to discuss about that point.

Thereby, this first stage consists in scoring every criterion and sub-criterion according to the importance and the relevance we consider it has in the context of the given case study. This way, criteria can be divided into three levels of importance, the most important ones having a scoring of 3, the medium ones of 2, and the least important of 1.

### 2. The evaluability

In addition, we can consider the evaluability of the criteria, because even if they are judged relevant in the previous step, they will not necessarily be quantifiable in the context of the case study chosen. However, an evaluable criterion will be easier to analyse than a non-evaluable one. Thereby, a non-evaluable criterion will get a score of 0, because of the difficulty to analyse it.

Furthermore, for evaluable criteria, the difficulty is to find the data to analyse them properly. Therefore, an evaluable criterion will get a score of 1, and if there is available information and data, this weight will raise to 2.

At the end, the sum of the scores obtained through these two steps will give a final grade for each criterion and depending on their rating, it will be decided if they are kept to realise the evaluation of the case study or not. This step will be realised in the second sub part of the next part, during the elaboration of the assessment framework specific to the Gloriette.

Finally, this part proposed in the first place a rather general analysis framework for the assessment of multi-use flood mitigation infrastructures. The different criteria, inspired from the TRANS-ADAPT ones were defined more precisely to lead to a rather complete framework, gathering the political, the economical and the social aspects. However, the analysis grid itself is not directly usable to make an assessment. The criteria cannot always be appropriate to analyse a case, it depends for example on the type of infrastructure considered, a management or a protection one, but also on the type of flood occurring in the place studied, by overflow or runoff. Thereby, an adaptation of the analysis grid is necessary to make the analysis grid as accurate as possible for any case, an adaptation method, considering the importance of the criteria given the specific context of the case, and the capacity to evaluate the criteria according to the availability of the data.